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CLAIMS

[Claim(s)]
[Claim 1]In a character reader which extracts candidates characters by a main class, compares an inputted character image with a dictionary part about the candidates characters, and outputs a collated result, A character reader having the main class method deciding part which determines a main class method using information over an inputted character image when extracting said candidates characters.
[Claim 2]An input part which inputs a character image, and a feature quantity extracting part which extracts characteristic quantity from a character image inputted by said input part, The main class method deciding part which determines a main class method using information over an inputted character image, A classification part which extracts candidates characters with a main class method determined by said main class method deciding part, and characteristic quantity extracted by said feature quantity extracting part, A character reader provided with a detailed classifying part which calculates a dictionary part and dissimilarity for collation to candidates characters narrowed down by said classification part, and an outputting part which outputs as a candidate a character category obtained by said detailed classifying part.
[Claim 3]In the character reader according to claim 1 or 2, said main class method deciding part, A kind of dictionary part specified as information over said character image, or a collation object character attribute in a dictionary part for collation, Or in having the picture attribute of a collation object character, determining whether perform a main class to these information and performing a main class. A character reader determining a main class method as it has a main class decision rule storage which stores a main class decision rule which matched the main class method.
[Claim 4]A character reader, wherein said main class method consists of a main class by distance of collation, a main class by candidate order, a main class by distance and a picture attribute of collation, or a main class that combined these methods in Claim 1 and the character reader according to claim 2 or 3.
[Claim 5]In the character reader according to claim 3, a kind of said dictionary part, A character reader provided with one or more dictionary parts of a dictionary part of only a Chinese character, a dictionary part of only the Japanese syllabary, a dictionary part of only an alphabetic character, a dictionary part of only a sign, a dictionary part of only a longwise character, a dictionary part of an oblong character, a dictionary part of only a small letter, or a dictionary part where these were intermingled.
[Claim 6]A character recognition method comprising:
An input process which inputs a character image.
A characteristic quantity extraction process of extracting characteristic quantity from a character image inputted by said input process.
The main class method decision process which determines a main class method using information over an inputted character image.
A main class process of extracting candidates characters with a main class method determined by said main class method decision process, and characteristic quantity extracted at said characteristic quantity extraction process, A specific classification process of calculating a

dictionary part and dissimilarity for collation to candidates characters narrowed down by said classification part, and an output process which outputs as a candidate a character category obtained at said specific classification process.

[Claim 7]A kind of dictionary part specified as information over said character image in the character recognition method according to claim 6, or a collation object character attribute in a dictionary part for collation, Or in having the picture attribute of a collation object character, determining whether to be whether a main class is performed to these information, and no and performing a main class. s which determines a main class method as is provided with a main class decision rule storage which stores a main class decision rule which matched the main class method -- a character recognition method making it like.
[Claim 8]A character recognition method, wherein said main class method consists of a main class by distance of collation, a main class by candidate order, a main class by distance and a picture attribute of collation, or a main class that combined these methods in the character recognition method according to claim 6 or 7.
[Claim 9]In the character recognition method according to claim 7, a kind of said dictionary part, A character recognition method provided with one or more dictionary parts of a dictionary part of only a Chinese character, a dictionary part of only the Japanese syllabary, a dictionary part of only an alphabetic character, a dictionary part of only a sign, a dictionary part of only a longwise character, a dictionary part of an oblong character, a dictionary part of only a small letter, or a dictionary part where these were intermingled.
[Claim 10]An inputting function which inputs a character image, and a characteristic quantity extract function which extracts characteristic quantity from a character image inputted by said inputting function, The main class method deciding function which determines a main class method using information over said inputted character image, A main class function to extract candidates characters with a main class method determined by said main class method deciding function, and characteristic quantity extracted by said characteristic quantity extract function, A recording medium which recorded a program for carrying out a specific classification function which calculates dissimilarity with a dictionary part for collation to candidates characters narrowed down by said main class function, and an output-functions part which outputs as a candidate a character category obtained by said specific classification function and in which computer reading is possible.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention about the recording medium which recorded the program for enforcing a character reader for recognizing a character, its method, and a method for the same, When recognizing a character especially, it is related with the recording medium which recorded the program for enforcing a character reader for performing a main class, narrowing down a candidate and performing more detailed recognition, its method, and a method for the same.
[0002]
[Description of the Prior Art]Conventionally, in the character reader, many methods of recognizing are taken by performing collation with an input character pattern and the dictionary part which created for every category. In this case, when the types of letters used as a recognition object are tens of orders like a number or a sign, even if it does collation calculation between an input character pattern and all the categories, can obtain a result at time short in comparison, but. When types of letters are thousands of orders like a Chinese character, as compared with computation time, such as a number and a sign, it takes the time of 100 times or more. When change of a font, character style, etc. is also taken into consideration to this, this collation calculation will take huge time. Then, in order to shorten collating time, processing in which perform a main class and detailed collation calculation is performed to the candidate who extracted the candidate to a small number comparatively and was extracted to the next is taken. By having independently a dictionary part for main classes, and a dictionary part for specific classification, and performing collation calculation (main class) with the characteristic quantity for main classes and the dictionary part for main classes which extracted from the character image as a method of performing this main class, for example, Whether collation calculation (specific classification's) with the dictionary part for specific classification being performed and the range to compare are determined (JP,S63-126082,A etc.).
[0003]
[Problem(s) to be Solved by the Invention]However, in the conventional character recognition method performed by narrowing down the number of candidates characters by this main class, If very similar by a method common irrespective of the kind of this recognition dictionary part when a user's use and the algorithm of character recognition use various recognition dictionary parts, there is a problem that we are anxious about the fall of recognition speed or recognition precision. There is SUBJECT of this invention in solving such a problem. That is, the purpose of this invention is to provide the recording medium which recorded the program for enforcing a character reader which can carry out character recognition at high speed and with high precision, its method, and a method for the same by taking the classifying method which was adapted for the picture attribute of the kind of dictionary part, or a collation object character.
[0004]
[Means for Solving the Problem]In a character reader which a character reader of Claim 1 of this invention extracts candidates characters by a main class, compares an inputted character image with a dictionary part about the candidates characters, and outputs a collated result, When

extracting said candidates characters, it had the main class method deciding part which determines a main class method using information over an inputted character image. This invention is characterized by a character reader of Claim 2 comprising the following.
An input part which inputs a character image.
A feature quantity extracting part which extracts characteristic quantity from a character image inputted by said input part.
The main class method deciding part which determines a main class method using information over an inputted character image.
A classification part which extracts candidates characters with a main class method determined by said main class method deciding part, and characteristic quantity extracted by said feature quantity extracting part, A detailed classifying part which calculates a dictionary part and dissimilarity for collation to candidates characters narrowed down by said classification part, and an outputting part which outputs as a candidate a character category obtained by said detailed classifying part.
In the character reader according to claim 1 or 2, a character reader of Claim 3 of this invention said main class method deciding part, A kind of dictionary part specified as information over said character image, or a collation object character attribute in a dictionary part for collation, Or when it had the picture attribute of a collation object character, it determined whether to be whether a main class is performed to these information, and no and a main class was performed, as it had a main class decision rule which matched the main class method, a main class method was determined. In Claim 1, Claim 2, or the character reader according to claim 3, a character reader of Claim 4 of this invention said main class method, It consists of a main class by distance of collation, a main class by candidate order, a main class by distance and a picture attribute of collation, or a main class that combined these methods. In the character reader according to claim 3, a character recognition method of Claim 5 of this invention a kind of said dictionary part, It had one or more dictionary parts of a dictionary part of only a Chinese character, a dictionary part of only the Japanese syllabary, a dictionary part of only an alphabetic character, a dictionary part of only a sign, a dictionary part of only a longwise character, a dictionary part of an oblong character, a dictionary part of only a small letter, or a dictionary part where these were intermingled.
[0005]This invention is characterized by a character recognition method of Claim 6 comprising the following.
An input process which inputs a character image.
A characteristic quantity extraction process of extracting characteristic quantity from a character image inputted by said input process.
The main class method decision process which determines a main class method using information over an inputted character image.
A main class process of extracting candidates characters with a main class method determined by said main class method decision process, and characteristic quantity extracted at said characteristic quantity extraction process, A specific classification process of calculating a dictionary part and dissimilarity for collation to candidates characters narrowed down by said classification part, and an output process which outputs as a candidate a character category obtained at said specific classification process.
In the character recognition method according to claim 6 a character recognition method of Claim 7 of this invention, A kind of dictionary part specified as information over said character image, or a collation object character attribute in a dictionary part for collation, Or when it had the picture attribute of a collation object character, it determined whether to be whether a main class is performed to these information, and no and a main class was performed, as it had a main class decision rule which matched the main class method, a main class method was determined.
In the character recognition method according to claim 6 or 7, a character recognition method of Claim 8 of this invention said main class method, It consists of a main class by distance of collation, a main class by candidate order, a main class by distance and a picture attribute of collation, or a main class that combined these methods. In the character recognition method according to claim 7, a character recognition method of Claim 9 of this invention a kind of said

dictionary part, It had one or more dictionary parts of a dictionary part of only a Chinese character, a dictionary part of only the Japanese syllabary, a dictionary part of only an alphabetic character, a dictionary part of only a sign, a dictionary part of only a longwise character, a dictionary part of an oblong character, a dictionary part of only a small letter, or a dictionary part where these were intermingled. An input part which a recording medium of Claim 10 of this invention is a recording medium in which computer reading for operating a computer as a character reader is possible, and inputs a character image for this computer, A feature quantity extracting part which extracts characteristic quantity from a character image inputted by said input part, The main class method deciding part which determines a main class method using information over an inputted character image, A classification part which extracts candidates characters with a main class method determined by said main class method deciding part, and characteristic quantity extracted by said feature quantity extracting part, A program for making it function as a character reader provided with a detailed classifying part which calculates a dictionary part and dissimilarity for collation to candidates characters narrowed down by said classification part, and an outputting part which outputs as a candidate a character category obtained by said detailed classifying part was recorded.

[0006]

[Embodiment of the Invention]Hereafter, one embodiment of this invention is described in detail based on Drawings.

(1) Functional constitution drawing 1 of a character reader is a block diagram showing the functional constitution of the character reader concerning one embodiment of this invention. The character reader concerning one embodiment of this invention comprises the input part 110, the feature quantity extracting part 120, the collating part 130, the outputting part 140, and the dictionary part 220 for collation. The collating part 130 comprises the main class method deciding part 132, the classification part 134, the detailed classifying part 136, and the main class method decision rule storage 210.

(2) The flow input part 110 of rough processing of character recognition performs pretreatment required for the following character recognition. First, the picture of manuscript paper etc. is read with a scanner. Reading of a picture may also read not only a scanner but the already read picture from a file etc. This read picture is displayed on a display and a character part is chosen from a pointing device like that inside to a mouse. A character part may be distinguished using the art of area identification. The normalization of size and noise rejection are performed to the picture of this selected character part. After these processings are completed, it is sent to the feature quantity extracting part 120. As a picture attribute of this inputted character, the density (white and black comparatively) of area, shape (longwise, oblong **), arrangement (a top, the bottom, middle, etc.), and a pixel, etc. are extracted, and it memorizes temporarily. It is judged with which dictionary part it compares automatically from area, shape (longwise, oblong **), and arrangement (a top, the bottom, middle, etc.) as a picture characteristic of a character.

[0007]as the dictionary part 220 for this collation, it was shown in drawing 3 -- as -- the dictionary part of only a Chinese character, the dictionary part of only the Japanese syllabary, the dictionary part of only an alphabetic character, the dictionary part of only a sign, the dictionary part of only longwise characters (an example, "1", "i", etc.), the dictionary part of oblong characters (an example, "-", "-", etc.), and a small letter (example: -- " .) " -- " -- the dictionary part of only characters small in area, such as "and "-", or the they-intermingled dictionary part is prepared, and 1 thru/or two or more dictionary parts are specified and compared from this inside. The feature quantity extracting part 120 extracts the feature vector which is the characteristic quantity used for recognition to the character image sent from the input part 110. This feature vector is created using the direction code histogram of JP,H1-250184,A, etc. The collating part 130 the main class method corresponding to the picture attribute of the kind of dictionary part, or a collation object character directed by the input part 110, It determines by the main class method deciding part 132 (after-mentioned) using the main class method decision rule of the main class method decision rule storage 210 (refer to drawing 5), By that main class method, classification of the input character is roughly carried out by the classification part 134, a candidate is scolded, and the detailed classifying part 136 calculates

dissimilarity for the extracted feature vector and the feature vector of the standard pattern registered into the dictionary part 220 for collation using a predetermined formula about this candidate. Calculation of this dissimilarity is calculated by Euclidean distance, a false Bayes discriminant function, etc., for example. As shown in drawing 4, the method of not performing the main class method by the distance of matching, the main class method by candidate order, the main class method by the distance and the picture attribute of matching, the main class method by combination, and a main class is one of this main class method. The outputting part 140 arranges in small order the dissimilarity which is a collated result to a collation object character, and outputs the fixed number (for example, ten pieces) per character code of them. The dictionary part 220 for collation has various kinds which were described above, and they hold information, including a character code, a standard pattern feature vector, etc., for every character registered.

[0008](3) Flow drawing 2 of the processing in one embodiment of this invention shows the flow of the processing in one embodiment of this invention. The picture of manuscript paper etc. is read with a scanner. Reading of this picture may also read not only a scanner but the already read picture from a file etc. This read picture is displayed on a display and a character part is chosen from a pointing device like that inside to a mouse. A character part may be distinguished using the art of area identification. The normalization of size and noise rejection are performed to the picture of this selected character part. As a picture attribute of this inputted character, the density (white and black comparatively) of area, shape (longwise, oblong **), arrangement (a top, the bottom, middle, etc.), and a pixel, etc. are extracted, and it memorizes temporarily (Step S100). By the dictionary part for which collation (refer to drawing 3) collation processing of this character to process is carried out judges from area, shape (longwise, oblong **), arrangement, etc. as a picture characteristic of this character (a top, the bottom, middle, etc.). This selected result is memorized temporarily (Step S110). The feature vector which is the characteristic quantity used for recognition is extracted to the inputted character image (Step S120). With the application of the main class method corresponding to the picture attribute of the kind of dictionary part which uses for the collation saved temporarily, or a collation object character, the main class method is determined as the main class method decision rule 210 (refer to drawing 5) (Step S130). By this determined main class method (refer to drawing 4), classification of the input character is carried out roughly, and a candidate is scolded (Step S140). About this candidate, dissimilarity is calculated for the feature vector of the standard pattern registered into the dictionary part 220 for collation specified as the extracted feature vector using a predetermined formula, and a final candidate's ****** is performed. Calculation of this dissimilarity is calculated by Euclidean distance, a false Bayes discriminant function, etc., for example (Step S150). The dissimilarity which is a collated result to a collation object character is arranged in small order, and a character code is outputted as the last candidate per fixed number of them (Step S160).

[0009](4) the case where the kind of explanation (A) dictionary part of the main class method deciding part 132 is specified -- a small letter (an example -- " .) with few dictionary part entries " -- " -- " -- " -- when the dictionary part of only a character with small area, such as ", is used, by a main class, the number of candidates is set to 0 and a right recognition result may not be obtained. In such a case, it is better to have not performed a main class or to replace the method of a main class with another thing according to the kind of dictionary part. For example, a rule is defined as are shown in drawing 5 and "a main class is not used", when the dictionary part of only a small letter is specified. In the case of a mixture dictionary part, the rule "which uses both the main class by matching distance and the main class by candidate order" is defined.

(B) As a picture attribute of the character image which was inputted in the case of the picture attribute of a collation object character, the dictionary part entry of a collation object may be specified in the same dictionary part with the density (white and black comparatively) etc. of the area, the shape (longwise, oblong **), the arrangement (the top, the bottom, the middle, etc.), and the pixel which were memorized temporarily. case [for example,] the rectangle area of an inputted image is small -- the small letter (" .) in a dictionary part " -- " -- the collation object

only of the entries, such as '', is carried out. Or it is targeted at the dictionary part of only a small letter in this case. It can consider that the dictionary part of only a Chinese character was specified depending on the density of a pixel, or can be regarded as what the dictionary part of only a longwise character and the dictionary part of only an oblong character were specified as depending on shape. Thus, when an object is limited, the main class method decision rule of the main class method decision rule storage 210 is applied like the time of the above-mentioned kind of dictionary part being specified.

[0010]Next, other embodiments of this invention are described based on Drawings. Drawing 6 is a block diagram showing the character reader concerning other embodiments of this invention. The character reader concerning other embodiments of this invention is constituted by computer paraphernalia with the hardware constitutions shown in drawing 6. These computer paraphernalia are provided with the following.

Input device 1.

Display 2.

CPU3.

The memory 4, the memory storage 5, and the medium drive 6.

The input device 1, the display 2, CPU3, the memory 4, the memory storage 5, and the medium drive 6 are connected mutually. The input device 1 is constituted by a keyboard, a mouse, touch panel, etc., and is used for the input of information. A scanner may be connected in order to input a character image. The display 2 carries out the display output of the information etc. which were inputted from various print-outs and the input devices 1. CPU(Central Processing Unit; central processing unit) 3 operates various programs. The memory 4 holds the information etc. which are created temporarily, when the program itself is held and the program is executed by CPU3. The memory storage 5 holds the main class method decision rule storage 210 and the dictionary part 220 for collation which treat with this device, a program, temporary information at the time of program execution, etc. The medium drive 6 equips with the recording medium which memorized a program, data, etc., reads them, and is used for storing in the memory 4 or the memory storage 5. It may use for input and output or carrying out program execution of immediate data (for example, document image data for character recognition, etc.). Each function which constitutes the character reader shown in drawing 1 in such computer paraphernalia is programmed, Write in recording media, such as CD-ROM, beforehand, and the computer carrying the medium drive 6 like the CD-ROM drive of each site is equipped with this CD-ROM, The same function as said embodiment can be carried out by storing a program in the memory 4 or the memory storage 5, and executing the program.

[0011]As a recording medium, they may be any of semiconductor media (for example, ROM, an IC memory card, etc.), optical media (for example, DVD-ROM, MO, MD, CD-R, etc.), and magnetic media (for example, magnetic tape, a flexible disk, etc.). The program which functions this invention can be distributed in the form of a medium. The program which functions this invention is stored in memory storage, such as a magnetic disk, and it is also possible to distribute in the form of download etc. by the communication network of a cable or radio. It may be made to provide the program which functions this invention by distributing by a broadcast wave. Capture an image from the scanner of the computer of a client side, send the captured picture to the input part 110 by the side of a server, perform recognition processing, and the outputting part 140 transmits a recognition result to the computer of a client side, The sent recognition result may be made to express as the computer of a client side. After performing initial processing of the picture captured by computer of the client side, it may be made to send the processing result to the input part 110 by the side of a server.

[0012]

[Effect of the Invention]As mentioned above, according to this invention, using the information (picture attribute of the kind of specified dictionary part, or a collation object character) about a collation object character, since it can change to the suitable main class method, recognition processing of a character can be carried out at high speed and with high precision.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a block diagram showing the character reader concerning one embodiment of this invention.
[Drawing 2]It is a flow chart for explaining operation of the character reader of drawing 1.
[Drawing 3]It is a figure for explaining the kind of dictionary part which uses by one embodiment of this invention.
[Drawing 4]It is a figure for explaining the kind of the main class method used by one embodiment of this invention.
[Drawing 5]It is a figure explaining the rule for determining the main class used by one embodiment of this invention.
[Drawing 6]It is a block diagram showing the character reader concerning other embodiments of this invention.
[Description of Notations]
110 An input part and 120 A feature quantity extracting part and 130 A collating part and 132 The main class method deciding part, 134 A classification part and 136 [A display, 3 CPU, and 4 / A memory and 5 / Memory storage and 6 / Medium drive.] A detailed classifying part, 140 outputting parts, the 210 main-class method decision rule storage, and 220 A dictionary part and 1 An input device and 2

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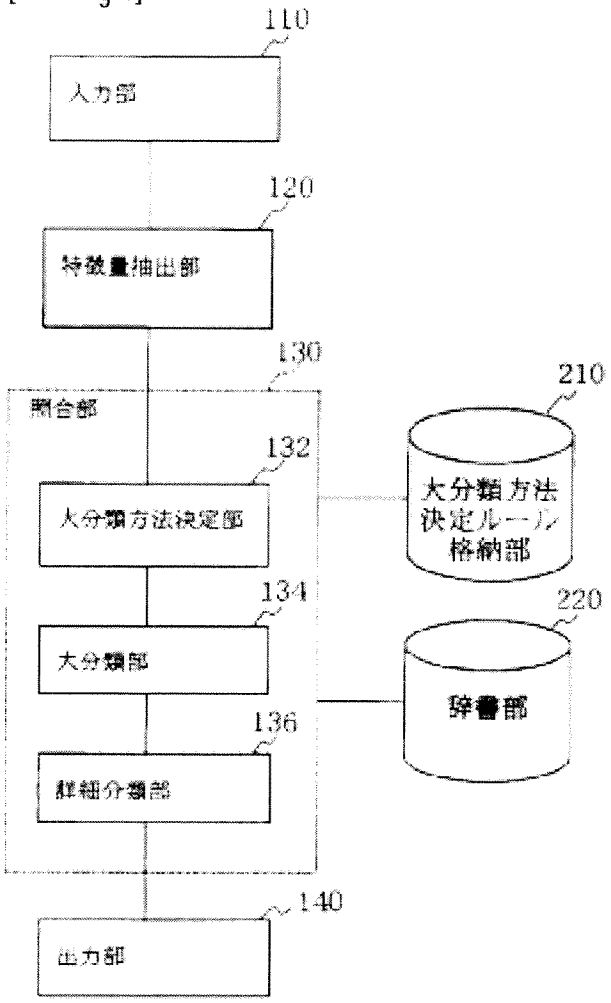
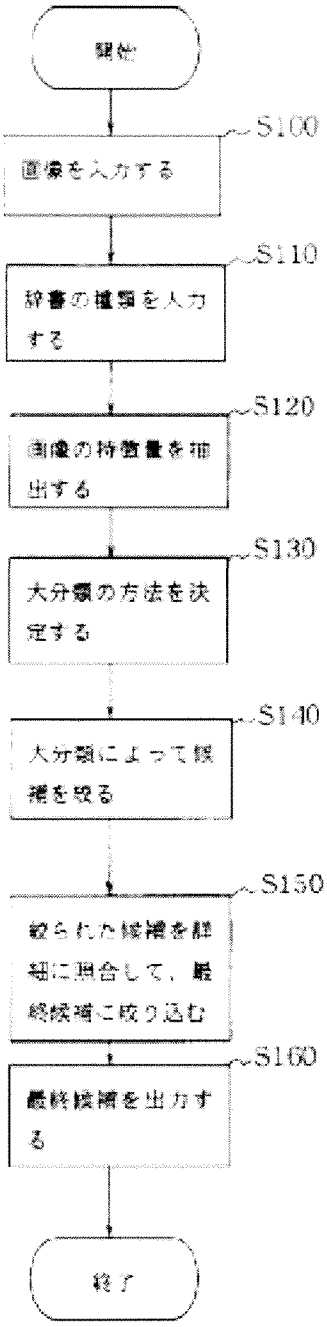
DRAWINGS

[Drawing 1]



[Drawing 2]


開始
S100
画像を入力する
S110
辞書の種類を入力する
S120
画像の特徴量を抽出する
S130
大分類の方法を決定する
S140
大分類によって候補を絞る
S150
絞られた候補を辞書に照合して、最終候補に絞り込む
S160
最終候補を出力する
終了

[Drawing 3]

辞書の種類

辞書1	漢字だけの辞書
辞書2	仮名だけの辞書
辞書3	英字だけの辞書
辞書4	数字だけの辞書
辞書5	記号だけの辞書
辞書6	縦長文字だけの辞書
辞書7	横長文字だけの辞書
辞書8	小文字だけの辞書
辞書9	漢字、仮名、英字、記号などの混在辞書
辞書10	辞書の中の一部を認識対象に指定した辞書

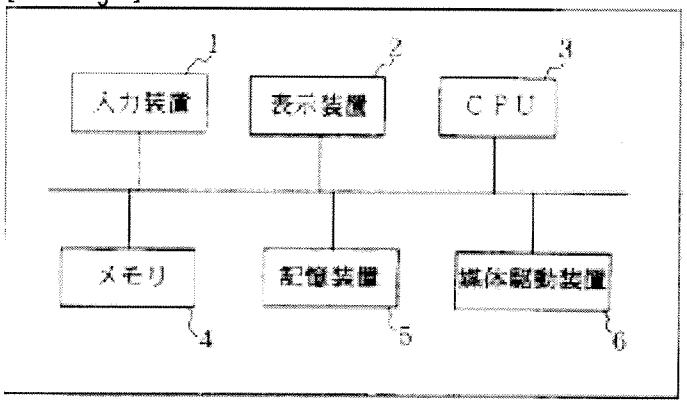
[Drawing 4]
大分類の方法

大分類方法1	マッチングの距離による大分類
大分類方法2	候補順位による大分類
大分類方法3	マッチングの距離と画像パラメータによる大分類
大分類方法4	組み合わせ大分類
大分類方法5	大分類を使わない

[Drawing 5]

辞書の種類	選択する大分類方法
小文字だけの辞書	大分類を行わない
英字、数字、仮名、漢字混在の辞書	マッチング距離、候補順位の両方による大分類

[Drawing 6]



[Translation done.]